

Attachment 2.1

Recommendations for Task Specific Plan for Parcel G

1. Introduction

The previous data collected by Tetra Tech EC Inc. has significant uncertainty due to widespread signs in data evaluation of falsification and data quality concerns and extensive allegations from former workers of patterns fraudulent practices. EPA's comments on the Navy's draft Workplan demonstrate that far more extensive sampling and analysis needs to be done to address potential exposure to future workers and residents due to the uncertainty regarding the potential extent of contamination. The Navy is drafting Task Specific Plans (TSPs) for its work on specific parcels, and we expect to receive the draft TSP for Parcel G for review soon. In anticipation of this forthcoming draft, EPA is also submitting recommendations in advance to inform the development of this draft.

The EPA, the State of California Department of Toxic Substances Control (DTSC), and the State of California Department of Public Health (CDPH) ("Regulators") recommends an alternative approach that will protect public health and the environment. As we wrote in December, 2016, "EPA recommends using a health-risk based approach to prioritize areas of concern based on factors that should include, but not be limited to, historical records of activities, current or future exposure based on land uses, sampling results already collected, and combination of highest risk radionuclides." In addition, other priority categories include specific allegations from former workers and data evaluation findings of signs of falsification and/or data quality concerns.

Full excavation, sampling, and scans targeted at the survey units associated with the greatest potential for contamination will be crucial first step to address uncertainty and demonstrate that the clean-up standards set in the RODs have been met. The results will provide evidence and better understanding about the potential scope of contamination parcel-wide to inform plans for resampling and rescanning the remaining survey u units in Parcel G.

Please note that these recommendations apply only to Parcel G, which is the next parcel proposed for transfer to the City. Other Parcels will be treated on a case-by-case basis. These recommendations only apply to soil survey units, which include trench units, fill units, and building site soil survey units. They do not apply to buildings, which will be discussed separately. These recommendations give a broad framework for an approach, and details will be refined as new reliable data is collected to inform future decisions.

2. Summary of Regulators' Proposed Approach

As a first step, full excavation, sampling, and scanning in survey units of highest concern will best protect public health and the environment. For trench soil survey units ("trench units"), if resampling of these targeted trench units, and the fill soil survey units ("fill units") within them, shows contamination was left behind, the Navy must fully excavate, sample, and scan all trench units and associated fill units in Parcel G.

Historically nationwide, sites often require statistical demonstration of at least 95% confidence that 95% of the site does not have concentrations that exceed site cleanup standards in order to clear property for commercial, industrial, and/or recreational purposes. For Parcel G trench units, that level of confidence can be reached if 33% (i.e. 21 out of 63 total) of trench units meet the remedial goals set forth in the Parcel G ROD. In this site, EPA recommends achieving a higher degree of confidence. A large portion of the site is slated for use as residential housing. Therefore, even if 33% of trench units are clean, for remaining trench units, EPA would require not only scanning of 100% of the surface of all fill in trenches but also core samples at depth to increase confidence for the remaining Parcel G trenches.

Similarly, for building site soil survey units, if in Step 1 full excavation, scanning, and sampling of any of the targeted 50% (16 out of total 32) units show contamination, then 100% of these units must be fully excavated, scanned and sampled. Even if all targeted units meet the remedial goals set forth in the Parcel G Record of Decision (ROD), then as Step 2, for the remaining Parcel G Building Site Soil survey units, EPA would still require scanning of 100% of the surfaces. These survey units are not deep, so no core subsurface samples would be required.

In all the above activities, the regulatory agencies will send inspectors to monitor field work closely and take independent samples and scans. See Attachment 2.2 for a table description framing the proposed approach.

3. Selection of priority survey units

Survey units for priority sampling will be selected based on criteria including the following:

- a. Historical documentation of specific potential upstream sources (e.g. buildings where radiological work was performed), spills, or other indicators of potential contamination
- b. Signs of potential falsification found in data evaluation, for example:
 - i. Gamma Scan Exceedance not investigated through collection of biased samples
 - ii. Gamma Static samples have low variability, e.g. less than 1000 counts per minute (cpm) and/or are not consistent with the Gamma Scan Data
 - iii. Onsite and off-site lab samples have different weights
 - iv. Some samples analyzed on different dates
 - v. Gamma scan results low enough to indicate potential degraded detectors or failure to operate detectors according to the workplans
- c. Signs of data quality problems found in data evaluation, for example
 - i. Missing gamma scan data
 - ii. Numerous results that are zero or negative, especially for Cs-137
- d. Allegations from former workers, for example:

- i. More than 3 rounds of excavation, which allegedly motivated falsification
- ii. Specific locations where workers reported wrongdoing

Other criteria may also be used as appropriate.

4. Step 1 – Full excavation, sampling, and scanning of priority survey units

Full excavation, sampling, and scanning must be conducted in priority survey units for trenches and building site survey units using the broad approaches required in previous Workplans,¹ with updates that improve reliability of results, as noted in EPA's comments on the Navy's draft new [insert full name of document] ("Workplan") The actions include full excavation of trench units, sampling and scanning of the side walls and bottom of the trenches, scanning of the excavated soil, and excavation of any contamination found.

Sampling results for each Radionuclide of Concern must be compared to the cleanup goal, i.e., Reference Background plus the Remedial Goal set in the Records of Decisions, updated if needed as part of the FiveYear Review. If an exceedance of the cleanup goal is found, and evaluation of equilibrium does not demonstrate that the value represents Naturally Occurring Radioactive Material (NORM), then that finding represents evidence of contamination. This failure to meet the cleanup goal would trigger the requirement to perform full excavation, sampling, and scanning of all trench units. A similar approach would apply to building site soil survey units.

5. Evaluation of Statistical Confidence

In order to support confident decision making that Parcel G trench and building site survey units meet ROD radiological cleanup levels with a high probability, EPA used the Visual Sample Plan (VSP) software tool based on several key assumptions. VSP was developed with support from the Department of Energy (DOE), EPA, the Department of Defense (DoD), the Department of Homeland Security (DHS), the Centers for Disease Control (CDC), and the United Kingdom. Applied properly, VSP is a tool that supports the development of a technically credible sampling plan based on statistical sampling theory and the statistical analysis of sample results.

At this site, EPA recommends achieving a high level of confidence. A 95% confidence level has been chosen for the determination of the initial effort, with the knowledge that the final confidence will actually be greater than 95%, given that all survey units will receive some level of assessment of the presence of radionuclides of concern. Nationwide, this level of confidence is common for ensuring compliance with cleanup standards at sites slated for commercial, industrial, and/or recreational use. For sites slated for residential use, a confidence level above 95% is common.

As a first step, EPA recommends prioritizing full excavation of trenches that have the highest concerns (targeted vs. random). Analysis using VSP concluded that for Parcel G, if 21 targeted trench units (33% of 63 total) do not show exceedances of cleanup standards (using MARSSIM

¹ See, for example, [give citation]

Class 1 evaluation), then Step 1 would show with 95% confidence that 95% of the total trench units would also not exceed standards. However, if even one trench unit shows exceedances, then we will no longer be able to achieve the desired confidence, and 100% excavation and 100% rescanning would be required for all trench units. If Step 1 shows no exceedances, then Step 2 would conduct further work (using a modified MARSSIM Class 2 or Class 3 evaluation) on the remaining trench units (67%) to increase the confidence level above 95%.

EPA followed a similar process to calculate the percent sampling required for building site survey units. Attachment 2.3 provides details to support the Regulators' proposed approach for resampling of Parcel G trench and building site survey units.

6. Step 2 – 100% surface scans and core samples

Only if Step 1 found no contamination exceeding the ROD clean-up goals in trench units or building site survey units, then Step 2 could be considered. Otherwise excavation of 100% of trench units or building site survey units would be required. For trench units, if in Step 1, the 33% of targeted trench units showed no contamination, then the remaining 67% (43) trench units must receive surface scans and core sampling. Similarly, for building site survey units, if in Step 1, the 50% of targeted building site soil survey units showed no contamination, then the remaining 50% (16) of units must receive 100% surface scans and, for trench units, core sampling.

- a. 100% Surface scans – To address the potential exposure to future residents, 100% surface scans would be required. The Navy must first remove any asphalt cover and any imported fill that may have been used to achieve the desired grade, i.e. not part of backfill that potentially came from an area excavated by Tetra Tech EC Inc. If contamination is found, then that survey unit must be fully excavated and treated in a manner similar to Step 1.
- b. Core samples – Only if no contamination is found in surface scans, then core samples would be an option to address potential exposure to future trench workers from contamination at depth. Each core will be scanned and will have a sample collected from the bottom, surface, and at any point exceeding the investigation level or, if no points exceed that level, then at the point of the highest gamma reading. If contamination is found, then that survey unit must be fully excavated and treated in a manner similar to Step 1.
 - i. *Inside the trench walls* - The number of core samples required within the trench walls will be determined based in new reliable data and statistical analysis.
 - ii. *Outside the trench walls* – Additional core samples will be collected within a foot outside the trench wall, laterally along each side of the trench.

7. Conclusion

In a situation of considerable uncertainty, the Regulators have proposed a robust plan that addresses multiple possible scenarios using information from history, data review, and known allegations. Even if new allegations arise in the future, the thorough approach

outlined above will protect public health and the environment through decisions based on evidence from new reliable data and sound statistical analysis.

Attachment 2.2

Regulators' Proposal for Parcel G Re-Sampling *

| | OPTION 1 | Description |
|---|---|--|
| | Follow Original Parcel G ROD: Unrestricted Release | Prove-out excavation of targeted survey units: could allow reduced effort for remainder, only if clean. Unrestricted Release |
| <u>Step 1:</u> Excavate and Scan all excavated soil as per original work plan | 100% (63) trench units 100% (32) building site survey units† | 33% (21) targeted trench units: if one trench unit fails, then 100% of Parcel G trench units must be excavated. 50% (16) targeted building site survey units†: if one building site survey unit fails, then 100% of Parcel G building site survey units must be excavated. |
| <u>Step 2 (Only if Step 1 shows no contamination):</u> Surface Scan and Core samples | N/A | 67% (42) trench units -- remove durable cover, then conduct surface scans and core sampling (core samples in each trench unit and additional core samples outside the trench wall): If any trench unit fails, <u>that</u> unit must be fully excavated and scanned. Number of samples inside unit to be calculated based on statistical analysis of variability of new reliable data. 50% (16) buildings site survey units -- conduct surface scans (surface soil samples in each survey unit): If any building site survey unit fails, <u>that</u> unit must be fully excavated and scanned. |

* The above proposal is restricted to **soil survey units** of Parcel G. For buildings at Parcel G, the regulators are not presenting options at this time. The default assumption is that the original work plan for buildings needs to be implemented again due to loss of confidence in previous results.

† The building site survey units include the 20 crawlspace SUs under building 351A and 12 SUs at Building 317/364/365 Site

Attachment 2.3

Statistician Evaluation of Parcel G Resampling and Confidence

The attached memo provides details to support the Regulators' proposal for the pilot of Parcel G trench and building site survey units using full excavation and scanning. In order to support confident decision making that Parcel G trench and building site survey units meet ROD radiological cleanup levels with a high probability, EPA used the Visual Sample Plan (VSP) software tool based on several key assumptions. VSP was developed with support from DOE, EPA, DoD, the Department of Homeland Security (DHS), the Centers for Disease Control (CDC), and the United Kingdom. Applied properly, it is a tool that supports the development of a technically credible sampling plan based on statistical sampling theory and the statistical analysis of sample results. (<https://vsp.pnnl.gov/description.stm>).

Historically it has been well established that statistical analyses of environmental data should be as conservative, powerful and as robust as possible (Green, 1979). To be conservative in the final assessment requires a high confidence level (represented by α) in the statistics that are applied and power is reflected by the levels set for β . Within the environmental community, high confidence implies 95% ($\alpha < 0.05$) or 99% ($\alpha < 0.01$) confidence. The greater the risk (health and cost) which will be incurred by making an incorrect assessment, the greater the confidence that is required. The greater the confidence required, the more samples/resources needed. EPA believes the proposed methodology provides the necessary statistical confidence and power to address clean up concerns for Parcel G.

At this site, EPA recommends achieving a high level of confidence. As a first step, EPA recommends prioritizing full excavation of trenches that have the highest concerns (targeted vs. random). A 95% confidence-level ($\alpha < 0.05$) has been chosen for the determination of sampling size, with the knowledge that the final confidence will actually be $>95\%$, given that all SUs will receive some level of assessment of the presence of radionuclides.

A statistical analysis using the VSP software was performed to identify the number of survey units that would need to be investigated as a MARSSIM Class 1 area in order to achieve a specified confidence level that the data could be used to draw inferences about the remainder of the survey units. The analysis was conducted by selecting a goal of achieving a 95% confidence that 95% of the total trench units would not be expected to exceed the release limit standard. The analysis concluded that 33% of the total number of survey units would require full excavation and investigation as a MARSSIM Class 1 survey unit to provide sufficient data to be representative of the remaining 67% of survey units at the 95% confidence level. For example, for a total of 63 survey units, 21 targeted trench units (33% of 63 total) would need to undergo full excavation and sampling as a MARSSIM Class 1 final status survey (FSS).

However, further work using a modified MARSSIM Class 2 or Class 3 evaluation would be needed on the remaining survey units not sampled due to the following factors:

- The statistical test used to derive the required number of survey units to be fully excavated and investigated as MARSSIM Class 1 SUs relies on the assumption that the 33% of the SUs selected sufficiently represent 95% of the remainder of SUs. Given the extent and variations in the ways which fraud occurred at the site, in many cases, it cannot be determined which SUs have falsified results and which do not. Therefore, the assumption of representativeness requires some level of verification sampling for the remainder of the SUs.
- In addition to the fraud that is alleged to have occurred, recent review of the previous investigation conducted by TetraTech EC revealed pervasive data quality issues for both the on-site and off-site lab, as well as a lack of compliance with the Work Plan for site investigative activities. It cannot be determined exactly which SUs had results that were not representative due to data quality issues or nonconformance with the Work Plans. These factors add to the uncertainty of using excavation and sampling data from the 33% of the SUs, to represent the remaining 67%.
- The statistical test provides a 95% confidence level that results from the 33% of SUs selected for sampling are representative of 95% of the remainder of SUs data; however, verification sampling of the remaining SUs that did not get full excavation and MARSSIM Class 1 surveys would provide an additional level of confidence in the results.
- Given that historical investigations have identified the presence of radiological objects with significant levels of radioactivity, such as deck markers painted with radioluminescent Ra-226 or containing Sr-90, the remaining 67% of the SUs will require gamma/beta scanning and verification sampling to check for the potential presence of radiological objects containing high levels of radioactivity.
- Hot spots of contamination may be present at any given location within the HPNS due to the nature of the site history, which indicates radiological contamination was discarded down sanitary and sewer drains and may have been present due to air deposition from nuclear tests on ships in the ocean, and others. Therefore, verification sampling for the presence of hot spots due to residual contamination must be conducted to meet the ROD requirements for the site.

Additionally, it should be noted that if one trench unit shows exceedances, then the inference drawn from the statistical test is that other SUs will contain exceedances and 100% excavation and 100% rescanning would be required for all trench units. Attached is a memo that gives more details about the statistical analysis.